

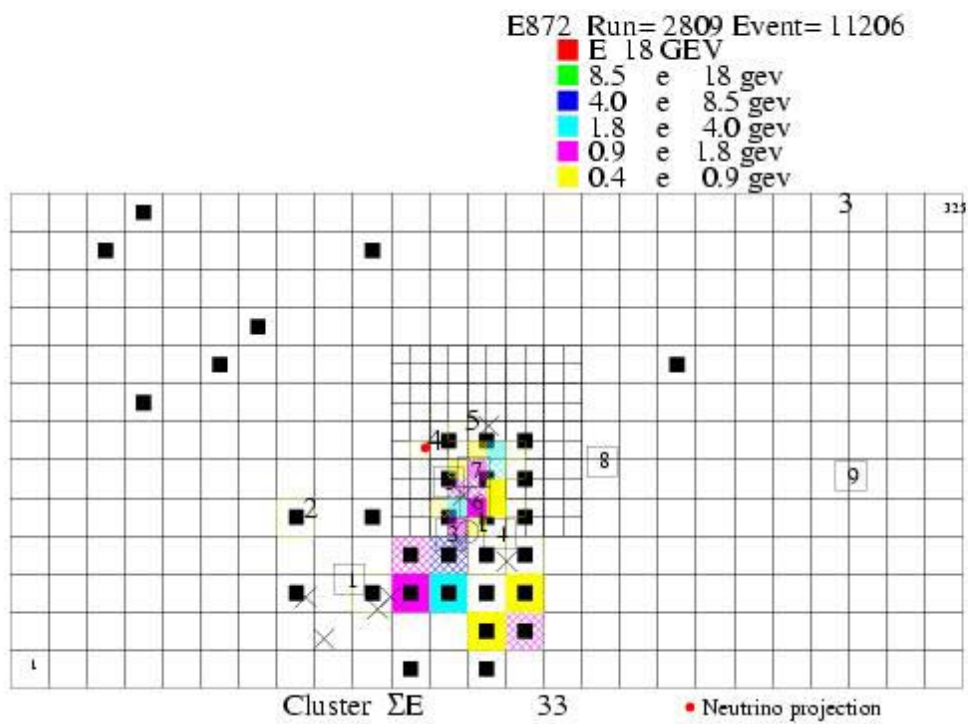
# Funky Electrons

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# What makes them funky?

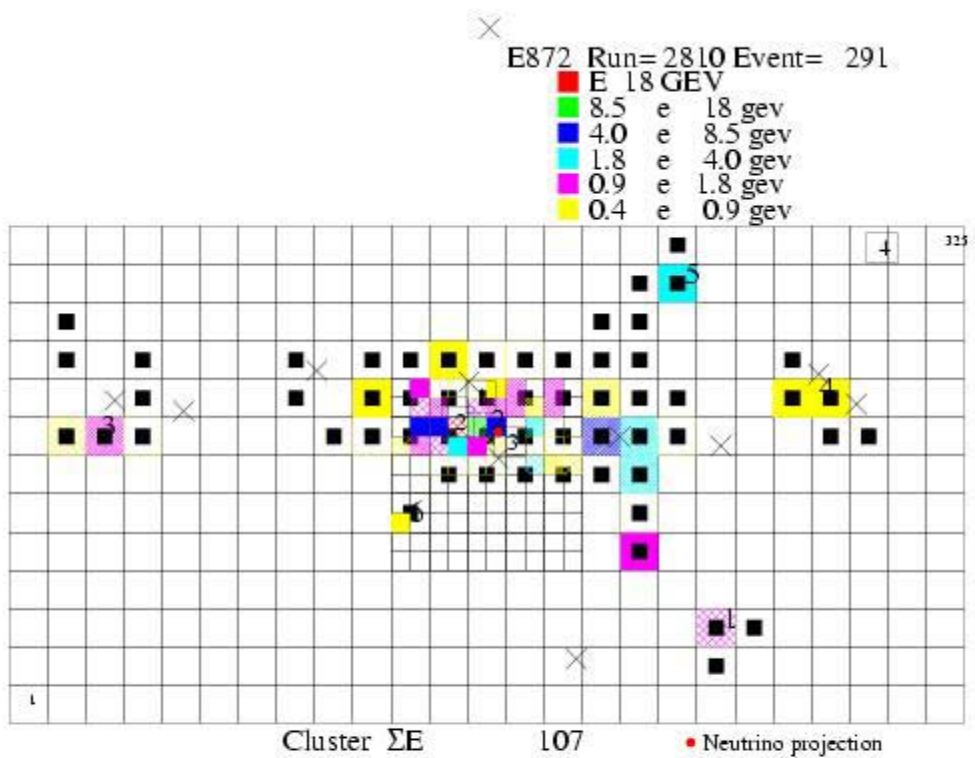
- A large fraction (26%) of located “ANN CCe” events have multiple primary emulsion tracks associated with the same EMCal cluster
  - EMCal cluster energy  $> 10 \text{ GeV}$
  - “associated”  $\rightarrow$  points to cluster within  $50 \text{ mr}$
  - Emulsion tracks are long and have good IP to the primary vertex
  - $\langle E_{clus} \rangle = 35 \text{ GeV}$
- Are these really funky?
  - Effect is not seen in CCmu and CCe Monte Carlo events



1	32.7
2	0.3
3	0.2
4	0.3
5	0.2

5 Close tracks

MCS mom ~20 GeV max, 48

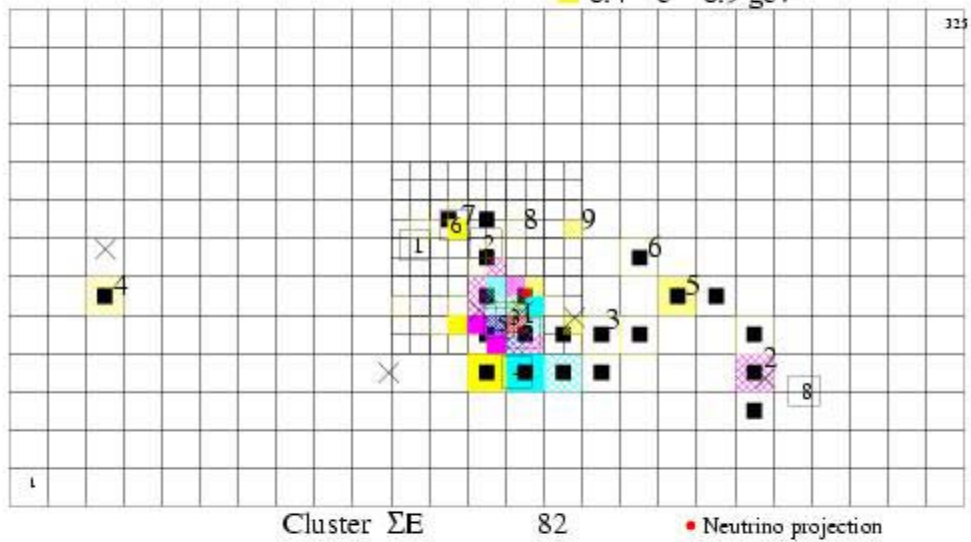


1	1.2
2	97.5
3	2.0
4	1.6
5	3.4
6	0.8

3 Close tracks

E872 Run= 2899 Event= 8585

■ E 18 GEV  
■ 8.5 e 18 gev  
■ 4.0 e 8.5 gev  
■ 1.8 e 4.0 gev  
■ 0.9 e 1.8 gev  
■ 0.4 e 0.9 gev

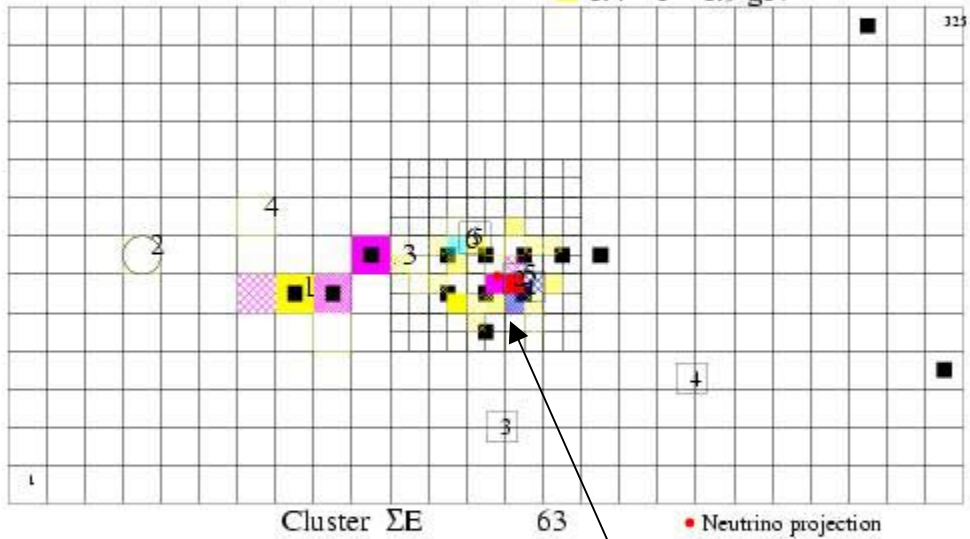


1	75.4
2	1.6
3	1.0
4	0.6
5	0.5
6	0.3
7	1.4
8	0.3

4 Close tracks

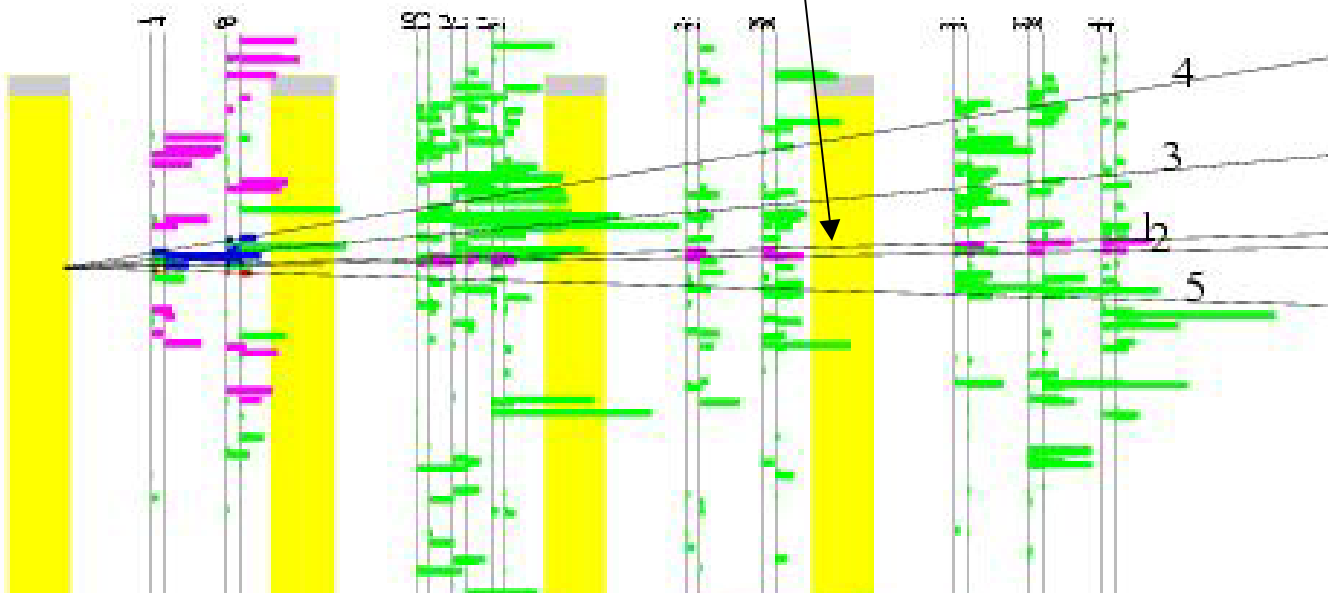
E872 Run= 3244 Event= 19107

■ E 18 GeV  
 ■ 8.5 e 18 gev  
 ■ 4.0 e 8.5 gev  
 ■ 1.8 e 4.0 gev  
 ■ 0.9 e 1.8 gev  
 ■ 0.4 e 0.9 gev



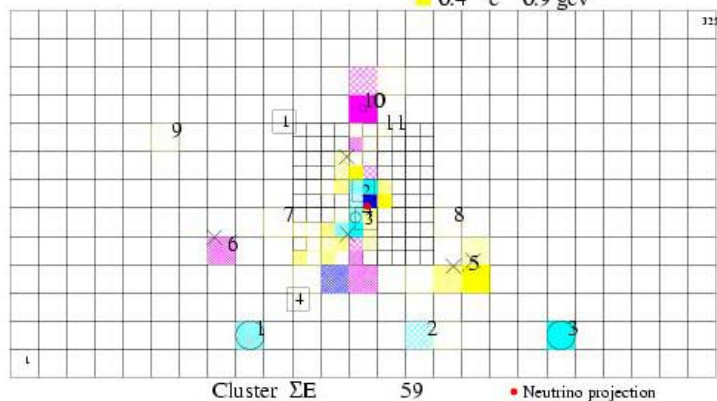
1	3.4
2	0.4
3	3.8
4	0.3
5	51.2
6	3.4

2 Tracks seen in SFT – 8 mr  
 Trk1: DC 300 GeV, MCS 2GeV  
 Trk2: DC 2.2 GeV, MCS 13+66  
 GeV, 14 plates  
 2Body Mass: 8 mr, 60,2.2 GeV  
 = 760 MeV



E872 Run= 3025 Event= 12221

E 18 GEV  
 8.5 e 18 gev  
 4.0 e 8.5 gev  
 1.8 e 4.0 gev  
 0.9 e 1.8 gev  
 0.4 e 0.9 gev



1	2.1	9	0.2
2	3.3	10	4.2
3	3.5	11	0.3
4	40.7		
5	2.0		
6	1.1		
7	0.3		
8	0.2		

E872 Run= 3025 Event= 12221

V V

-1200.0  
 -1300  
 0  
 -1200.0  
 -1300

-0.5

Vtx: Proc U V Z ntrk  
 0 25137 53393 907111 4

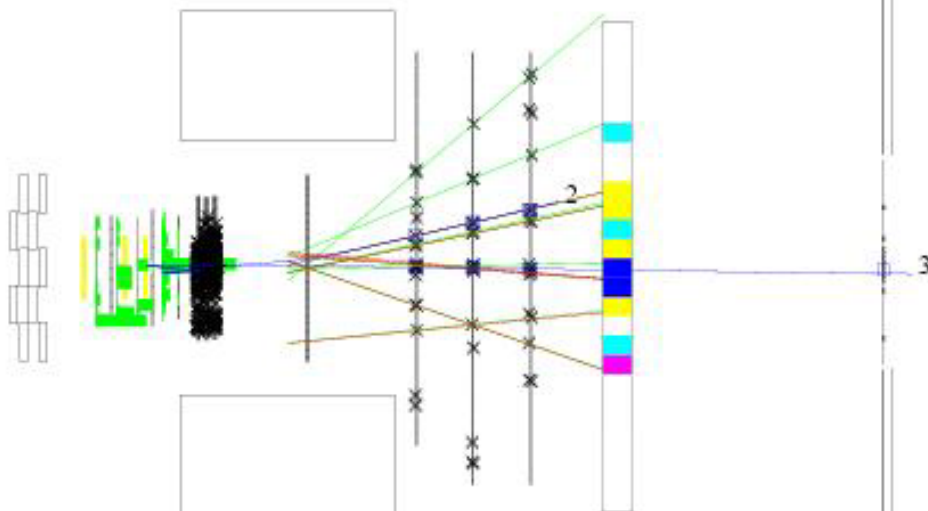
-1300  
 -1300  
 T2-T1

Another  $p$  candidate?

Trk2: DC -1.7GeV

Trk4: DC 38 GeV

2Body Mass: 23 mr = 710 MeV



Trk	Mom	Chi	nht	Emul	Vtx
1	0.0	0.4	13	1510005883	1
2	-1.7	0.3	20	1510006140	1
3	37.5	6.1	24	1510006193	1
4	0.0	0.6	13	1510006208	1

# Possible Scenarios

- Lepton hemisphere
  - Internal brehmsstrahlung in the struck nucleus
  - Diffractive processes ( $\rho$  production)
    - Atypical large hadronic energy deposition in the EMCal
- Nuclear hemisphere
  - Strange angular correlations (heavy mass states?)
    - Atypical large hadronic energy deposition in the EMCal

# Notes on histograms - 1

- Define lepton direction
  - CCmu: muon direction
  - CCe: vector between primary vertex and largest EMCal cluster ( $>10$  GeV)
- Page 1 of theta\_data.ps and theta\_mc show angle between ALL primary emulsion tracks and the lepton direction
  - Note “shoulder” in histogram ID 11 in the data below 60 mr
- Number of events
  - 117 ANN CCe events
  - 74 with Emcal Cluster  $> 10$  GeV
  - 31 with  $>1$  close tracks (nclos in histos)
  - $31/74 = 42\%$  with close tracks



# Notes on histograms - 2

- Page 2 shows the number of close tracks (nclos) within 50 mr of the largest cluster direction
  - See an increase(?) in nclos vs cluster energy for CCe events
- Page 3 shows the  $\delta\phi$  distribution for Ccmu and CCe events
  - Events with nclos>1 appear to be a mix of CCe and NC

# EMCal shower shapes

- Check EMCal shower shape – Monte Carlo
  - Generate 500  $e, \pi$  single tracks with  $10 < \text{Mom} < 80 \text{ GeV}$
  - Electromagnetic showers asymmetric
    - 93% with  $E_{\text{clus}} > 10 \text{ GeV}$  &  $\text{asymmetry} > 0.4$
  - Hadronic showers symmetric
    - 8% of  $\pi$ 's have  $> 50\%$  of energy in the EMCal
    - $< 1\%$  have  $> 80\%$  of energy in the EMCal
    - 96% with  $E_{\text{clus}} > 10 \text{ GeV}$  &  $\text{asymmetry} < 0.4$
- Checked 27 events with  $n_{\text{clos}} > 1$ 
  - 22 look hadronic
  - 5 look electromagnetic

# ECC vs Bulk

- Checked CCE events for Z,A dependent effects (ECC vs Bulk)
  - Bulk: 14 (evts w  $n_{\text{clos}} > 1$ )/33 evts = 42%
  - ECC: 20 (evts w  $n_{\text{clos}} > 1$ )/51 evts = 39%